NOTE: Use a photometer with a receiver aperture 0.5 in (13 mm) diameter, shielded to eliminate stray light.

c. Place the light source center 2.1 in (53 mm) from the aperture center for a 0.1 degree observation angle.
d. During testing, spin the reflectors to average the orientation effect.
e. The Department will reject a tested reflector if it fails the specific intensity minimum. If more than 2 reflectors fail out of 50 tested, the Department will reject the lot.

3. Seal Test

Use this test to determine if a reflector is adequately sealed against dust and water.

a. Submerge 50 samples in a water bath at room temperature.
b. Subject the submerged samples to a vacuum of 5 in (125 mm) gauge for 5 minutes.
c. Restore atmospheric pressure and leave the samples submerged for 5 minutes.
d. Examine the samples for water intake.
e. The Department will reject the lot if more than 2 percent of the reflectors fail.

4. Heat Resistance Test

a. Place three reflectors in a horizontal position on a grid or perforated shelf inside a circulating oven that allows air to circulate freely.
b. Set the oven temperature at 175 °F, ± 5 °F (80 °C, ± 3 °C) and let the specimens sit at this temperature for 4 hours.
c. After the 4 hours, remove the samples from the oven and let them cool in air to room temperature.
d. Rejection: The Department will reject the lot if any sample shows significant change in shape and general appearance when compared with unexposed control standards.

D. Materials Warranty

General Provisions 101 through 150.

Section 917—Reflectors and Nonreflective Characters

917.1 General Description

This section includes the requirements of demountable characters with Type VI reflective sheeting, and direct-applied, nonreflective characters.

917.1.01 Related References

A. Standard Specifications

Section 106—Certification of Materials

Section 913—Reflectorizing Materials

B. Referenced Documents

ASTM B 209 (B 209M)

ASTM D 822

917.2 Materials

917.2.01 Demountable Characters with Type VI Reflective Sheeting

A. Requirements

1. Use Type VI reflective sheeting letters, numerals, symbols, and borders that meet the requirements of Subsection 913.2.02, Type VI.
2. Use a silver color, unless otherwise specified on the Plans.
3. Apply the characters to aluminum flat frames as recommended by the sheeting manufacturer.
4. Use flat frames (letter, numerals, symbols and borders) made from aluminum sheet 0.032 in (0.813 mm) thick matching ASTM B 209 (209M), Alloy 3003-H14.

5. Submit to the Department:
   - One letter of a predominant size and type to be used on the Project.
   - A certificate to the Engineer stating that the material used on the Project is the same as the sample submitted.

B. Fabrication

1. Before applying any sheeting, properly degrease, etch, and treat each frame with a light, tight amorphous chromate-type coating.
2. Mechanically apply the reflective sheeting to the prepared flat aluminum frames. Use the proper equipment as prescribed by the sheeting manufacturer.
3. When recommended by the sheeting manufacturer, coat the completed demountable letters, numerals, symbols and borders with a clear finish approved by the sheeting manufacturer.

   Apply the clear coat to the sheeting surface to ensure the sheeting has a fully glossy coat and a complete edge seal.
4. Ensure that the finished letters, numerals, symbols, and borders show careful workmanship, are clean cut, sharp, and have a plane surface.
5. Use the character size and shape to determine the hole spacing to mount the frame with aluminum rivets or other approved non-corrosive fasteners. Do not space holes more than 8 in (200 mm) on center.

C. Acceptance

The Department will accept the material based on test results of samples taken by the Department or of samples submitted by the manufacturer or fabricator, when directed. The sample shall consist of one letter of predominant size and type to be used on the Project. Samples submitted by the manufacturer or fabricator to the Engineer, shall include a certificate stating that the material used on the Project is the same as the sample submitted.

D. Materials Warranty

General Provisions 101 through 150.

917.2.02 Direct Applied Nonreflective Characters

A. Requirements

1. Use direct-applied, nonreflective characters as opaque legend, stripping, and symbols on traffic control signs made from reflective sheeting that meets Subsection 913.2.
2. Use nonreflective, weatherproof plastic film that is precoated with pressure-sensitive or heat-sensitive adhesive backing.
3. Use sheeting that is flexible enough to be easily cut, shaped, and applied over reflective sheeting.
4. Submit the manufacturer's certification to the Engineer showing the properties of the materials used and how they match the Specifications, as required by Subsection 106.05, "Materials Certification."
5. Ensure that the nonreflective sheeting is weather resistant after processing and application, according to the manufacturer's recommended procedures.
   a. Expose the nonreflective sheeting for 1,200 hours in an Atlas Twin Arc Weatherometer, as per ASTM D 822.
   b. Clean the sheeting.
   c. The Department will reject nonreflective sheeting that appreciably discolors, cracks, crazes, blisters, changes dimensionally, or adversely effects the reflective sheeting on which it is mounted.
6. Use adhesive that has the following characteristics:
   - Is precoated and pressure-sensitive (Class 1) or tack-free and heat-activated (Class 2). Be able to apply either without adding more adhesive to either the nonreflective sheeting or to the reflective sheeting.
   - Has a protective liner that can be peeled off without being soaked in water or other solvents.
   - Ensure that the liner is easily removed after accelerated storage for 4 hours at 150 °F (65 °C) under 2.5 psi (17 kPa) of pressure.
   - Forms a durable, vandal-resistant bond to smooth and weather resistant surfaces.
   - Adheres securely at temperatures ranging from–30 ° to 200 °F (–35 ° to 95 °C), just 48 hours after application.
   - Prevents the sheeting from shocking off the panel when struck at –10 °F (–25 °C).

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will accept the material based on the manufacturer's certificate.

D. Materials Warranty

General Provisions 101 through 150.

Section 919—Raised Pavement Markers

919.1 General Description

This section includes the requirements for raised pavement marker materials for use in reflective, ceramic, and channel markers.

919.1.01 Related References

A. Standard Specifications

General Provisions 101 through 150.

B. Referenced Documents

ASTM C 424

ASTM C 373

ASTM D 2240

ASTM D 4280

Federal Method TT-T-141, Method 4252

919.2 Materials

A. Requirements

Do not use any marker materials until the laboratory approves it.

1. Use raised pavement marker sources as listed in QPL 76.
2. Use raised pavement markers of the type shown in the Plans or specified in the proposal. This Specification references markers as follows:

Type	Description
1	One-way, one-color, 4 x 2 in (100 mm x 50 mm), reflective
2	Two-way, one-color, 4 x 2 in (100 mm x 50 mm), reflective
3	Two-way, two color, 4 x 2 in (100 mm x 50 mm), reflective
4	Round white, yellow or black ceramic, non reflective
5	Oval white, yellow or black ceramic, non-reflective
6	Oval white or yellow ceramic, reflective
7	White or yellow ceramic jiggle bar, non-reflective
8	White or yellow ceramic jiggle bar, reflective
9	White or yellow channel, non-reflective
10	White or yellow channel, reflective
11	Two-way, one-color, 4 x 4 in (100 mm x 100 mm), reflective
12	One-way, one color, 4 x 4 in (100 mm x 100 mm), reflective